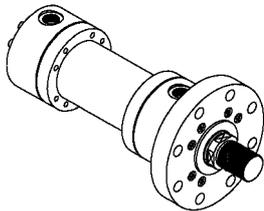
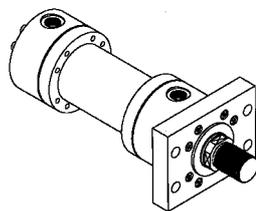
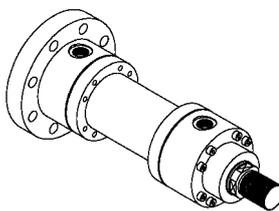
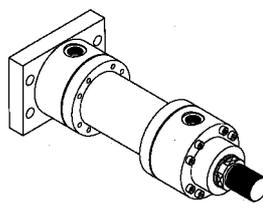
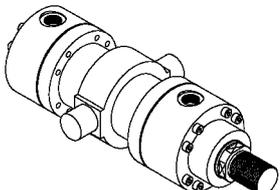
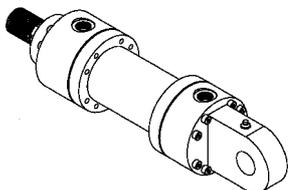
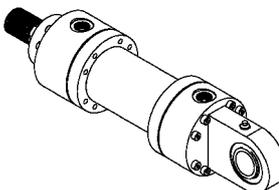
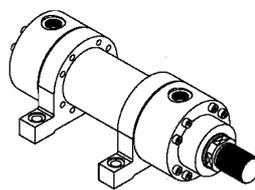
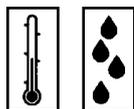


## ◆ MOUNTING STYLES

| Available mountings and where to find them   |   |  |  |
|--|---|--|--|
| <p>Front Circular Flange Mount<br/>– Style FCF</p>  <p>(ISO style MF3) page 3</p> | <p>Front Rectangular Flange Mount<br/>– Style FRF</p>  <p>(ISO style MF1) page 3</p> | <p>Rear Circular Flange Mount<br/>– Style RCF</p>  <p>(ISO style MF4) page 3</p>   | <p>Rear Rectangular Flange Mount<br/>– Style RRF</p>  <p>(ISO style MF2) page 3</p> |
| <p>Intermediate Fixed Trunnion Mount – Style T</p>  <p>(ISO style MT4) page 5</p>  | <p>Rear Pivot Mount<br/>– Style P</p>  <p>(ISO style MP3) page 5</p>                 | <p>Rear Spherical Bearing Mount<br/>– Style SBp</p>  <p>(ISO style MP5) page 5</p> | <p>Side Lug Mount<br/>– Style SL</p>  <p>(style MS2) page 7</p>                     |

## ◆ FLUIDS AND TEMPERATURES



### Temperatures

Standard cylinders may be operated at temperatures of -45 to +90°C. For temperatures over 90°C consult the factory for specific recommendations giving operating temperature, source and characteristics of the heat, medium and cycle time. It should be noted that many seal compounds exhibit reduced life as the temperature nears their stated limit. In such applications, it is a good practice to specify high-temperature seals to assure long, satisfactory life.

### Fluids

Seal materials employed in standard ER Series cylinders are Buna-N, Polyurethane and Teflon. As such, standard cylinders are particularly suited for use with any good grade petroleum base hydraulic oil. For normal temperature ranges, an oil having a viscosity range of 250-300 S.S.U. at 38°C is recommended. The oil should be maintained at SAE Level 3-4 cleanliness, normally accomplished with a 10 micron filtration system. Standard

seals are also compatible with most Water-Glycol and Water-Oil Emulsion fluids with temperatures limited to a maximum of 60°C. Whenever there is a question of compatibility, contact the factory or the fluid manufacturer. NEVER change system fluid or MIX fluids until a careful check as to compatibility has been made.

Fire Resistant Fluids such as Phosphate Esters and Chlorinated Hydrocarbons require special seal compounds. These can be supplied in lieu of the standard seals at a moderate extra charge. The specific fluid and/or seal compounds should always be given on your order.

Cylinders to be operated with raw water as the fluid medium require special plating and/or special materials. There are two general classifications of cylinders made for use with water: (1) Water-Fitted Cylinders and (2) Water-Hydraulic Cylinders. Consult factory for additional information.

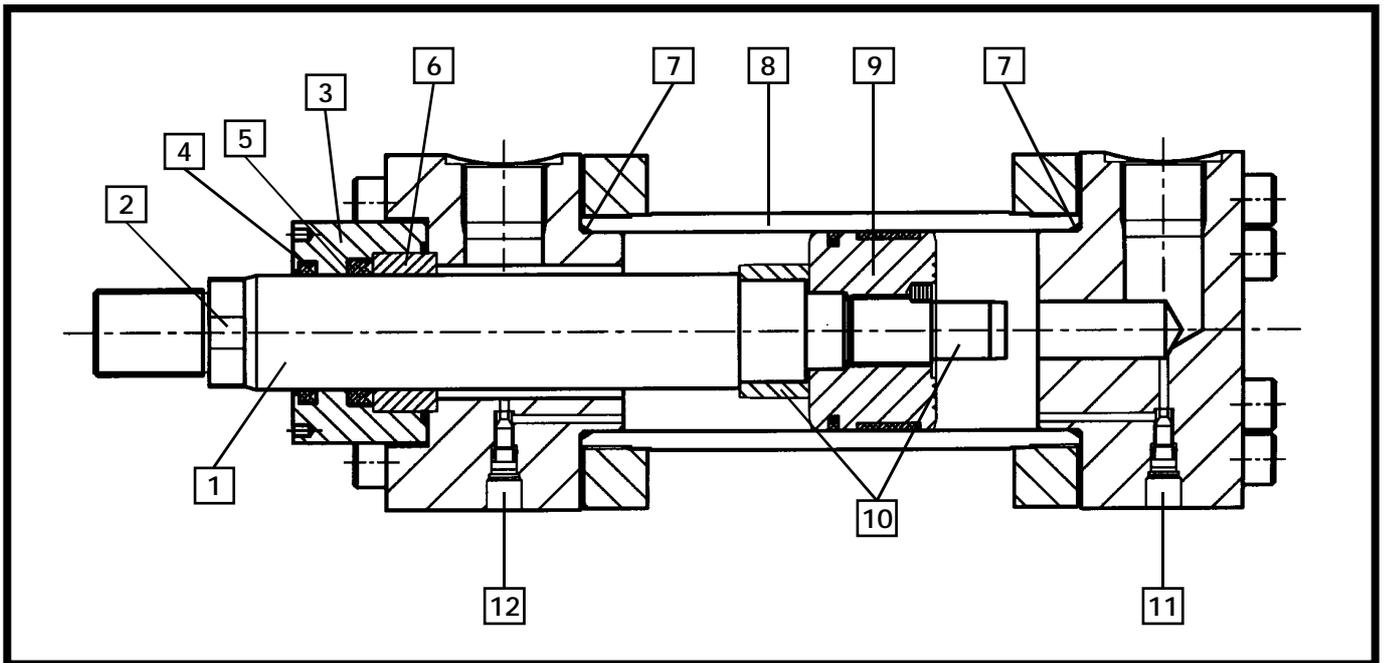
### Standard Specifications

#### ISO 6020/1

- Construction: Heads bolted to flanges
- Working Pressures to 160 bar
- Bore sizes 40mm – 200mm
- Rod diameters 22mm – 140mm
- Standard fluid – Hydraulic Oil
- Strokes in any practical length
- Cushions optional at either or both ends
- Air bleeds optional at either or both ends
- Temperatures – 45°C to +90°C with standard seals
- Choice of 8 mounting styles
- Choice of 2 rod diameters per bore

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# CONSTRUCTION



## 1 Piston Rod

Piston rods are manufactured from precision ground, high tensile steel and hard chrome plated. In addition, they are induction case hardened to give a dent resistant surface.

## 2 Wrench Flats

Four wrench flats are provided as standard for easy attachment on all rod diameters.

## 3 Rod Gland

Easily removable for replacement of rod packings and wiper. It is not necessary to disassemble the cylinder. Easier to service since, on removal of the ductile iron gland, the piston rod remains supported by the separate rod bearing.

## 4 Rod Wiper

Synthetic wiper is designed to wipe off abrasive dust and contaminants on the retract stroke to ensure long life for packings, rod bearing, and piston rod. Where the rod will be exposed to gummy materials such as "road tar", a metallic rod scraper is available.

## 5 Rod Seal

The polyurethane rod seal has a unique design which incorporates the optimum sealing properties of a "U" configuration with the elastomeric properties of a compression-type seal. The polyurethane material was selected for toughness, abrasion resistance, and the ability to resist extrusion under rough service conditions.

## 6 Rod Bearing

High load bearing bronze piloted into the head. Located inboard of the seals to ensure a well lubricated bearing for the fastest cycling applications. It need not be removed for rod seal replacement.

## 7 Static Seals

Pressure activated "O" ring seals are used at rod gland and tube ends. Located to eliminate extrusion and to provide positive leak tight seal.

## 8 Tube

The steel tube is honed to a 0.4 micro metres  $R_a$  max finish for low friction and long seal and piston bearing life. Tube ends are machined on the O.D. concentric with the I.D.

## 9 Pistons and Piston Seals

All pistons are machined from a fine grain alloy iron. They are threaded directly onto the piston rod, torqued and sealed. The piston seal is an endless glass filled Teflon material with an "O", ring expander. One or more (depending on bore size) bronze filled Teflon bearing strips are also employed on this type piston to eliminate metal-to-metal contact. This type of piston offers long life, low friction, near zero leakage, and great tolerance for side loading. It can be used successfully on virtually any application and is offered as standard at no extra cost.

## 10 11 12 Cushions

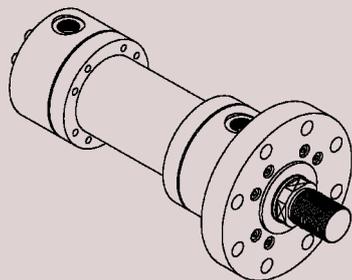
Cushion pistons (10) are tapered to provide gradual deceleration and eliminate shock upon entrance. The adjusting screw with fine threads (11) provides a wide range of adjustment. It is interchangeable with the ball check (12) permitting field changes of position. Neither the adjusting screw nor ball check plug project beyond the head or cap surface and are held captive by a retaining ring.

## Air Bleeds (Optional)

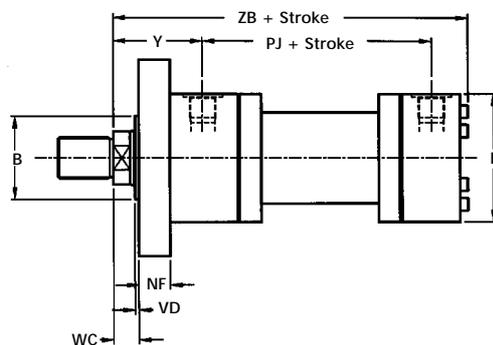
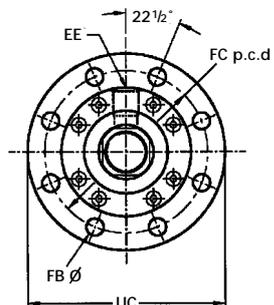
When required, air bleeds are located where they can be employed most successfully. The straight thread plugs are equipped with metallic "O" rings so they can be used repeatedly with a good seal every time. Consult factory for further details.

# FLANGE MOUNTINGS

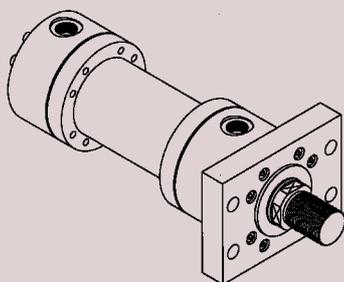
## Front Circular Flange Mount – Style MF3



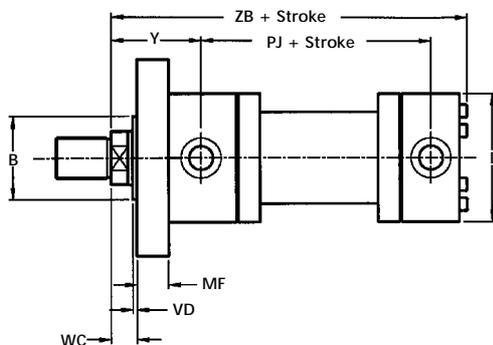
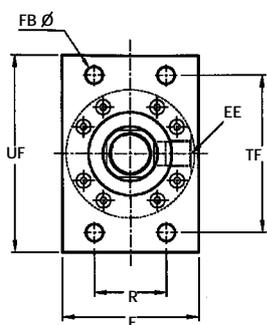
(ISO style MF3)



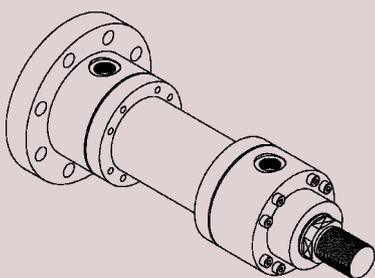
## Front Rectangular Flange Mount – Style MF1



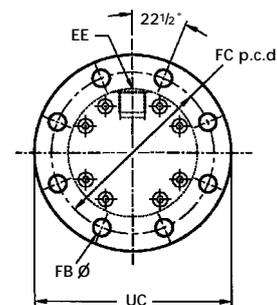
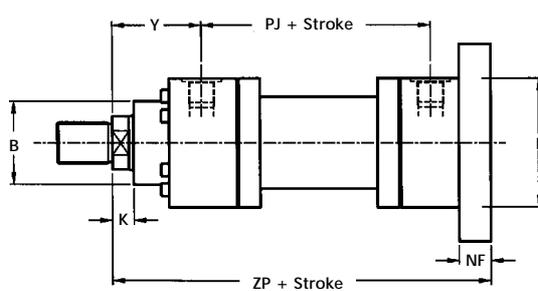
(ISO style MF1)



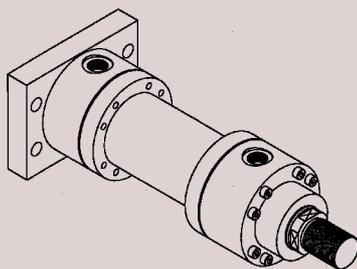
## Rear Circular Flange Mount – Style MF4



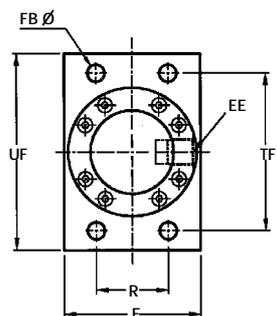
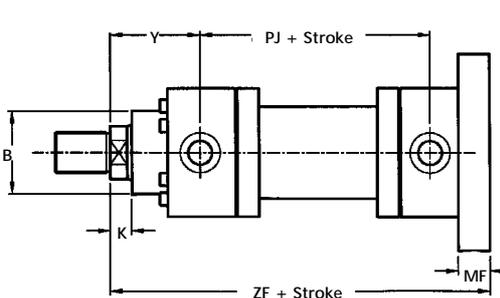
(ISO style MF4)



## Rear Rectangular Flange Mount – Style MF2



(ISO style MF2)



# FLANGE MOUNTINGS DIMENSIONS

| Bore | MM Rod Dia. | B f8 | D Max | E   | EE BSP | FB h13 | FC  | K  | MF |
|------|-------------|------|-------|-----|--------|--------|-----|----|----|
| 40   | 22          | 50   | 78    | 80  | 1/2    | 9      | 106 | 13 | 16 |
|      | 28          |      |       |     |        |        |     |    |    |
| 50   | 28          | 60   | 94    | 100 | 1/2    | 11     | 126 | 14 | 20 |
|      | 36          |      |       |     |        |        |     |    |    |
| 63   | 36          | 70   | 113   | 120 | 3/4    | 13.5   | 145 | 16 | 25 |
|      | 45          |      |       |     |        |        |     |    |    |
| 80   | 45          | 85   | 130   | 135 | 3/4    | 17.5   | 165 | 18 | 32 |
|      | 56          |      |       |     |        |        |     |    |    |
| 100  | 56          | 106  | 158   | 160 | 1      | 22     | 200 | 20 | 32 |
|      | 70          |      |       |     |        |        |     |    |    |
| 125  | 70          | 132  | 192   | 195 | 1      | 22     | 235 | 23 | 32 |
|      | 90          |      |       |     |        |        |     |    |    |
| 160  | 90          | 160  | 238   | -   | 1 1/4  | 22     | 280 | 25 | -  |
|      | 110         |      |       |     |        |        |     |    |    |
| 200  | 110         | 200  | 285   | -   | 1 1/4  | 26     | 340 | 30 | -  |
|      | 140         |      |       |     |        |        |     |    |    |

**Important Notice**  
For optional ports see page 8

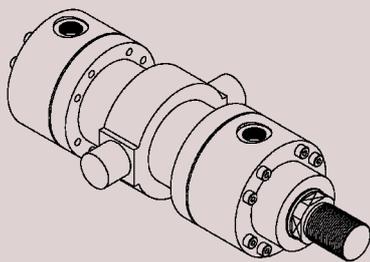
Be sure to add Stroke to these Dimensions

| Bore | MM Rod Dia. | NF | PJ  | R    | TF    | UC Max | UF  | VD Min | WC | Y   | ZB Max | ZF  | ZP  |
|------|-------------|----|-----|------|-------|--------|-----|--------|----|-----|--------|-----|-----|
| 40   | 22          | 16 | 97  | 40.6 | 98    | 125    | 115 | 3      | 16 | 71  | 196    | 206 | 206 |
|      | 28          |    |     |      |       |        |     |        |    |     |        |     |     |
| 50   | 28          | 20 | 111 | 48.2 | 116.4 | 148    | 140 | 4      | 18 | 72  | 213    | 225 | 225 |
|      | 36          |    |     |      |       |        |     |        |    |     |        |     |     |
| 63   | 36          | 25 | 117 | 55.5 | 134   | 170    | 160 | 4      | 20 | 82  | 234    | 249 | 249 |
|      | 45          |    |     |      |       |        |     |        |    |     |        |     |     |
| 80   | 45          | 32 | 134 | 63.1 | 152.5 | 195    | 185 | 4      | 22 | 91  | 260    | 282 | 282 |
|      | 56          |    |     |      |       |        |     |        |    |     |        |     |     |
| 100  | 56          | 32 | 162 | 76.5 | 184.8 | 238    | 225 | 5      | 25 | 108 | 312*   | 332 | 332 |
|      | 70          |    |     |      |       |        |     |        |    |     |        |     |     |
| 125  | 70          | 32 | 174 | 90.2 | 217.1 | 272    | 255 | 5      | 28 | 121 | 337*   | 357 | 357 |
|      | 90          |    |     |      |       |        |     |        |    |     |        |     |     |
| 160  | 90          | 36 | 191 | -    | -     | 316    | -   | 5      | 30 | 143 | 386*   | -   | 406 |
|      | 110         |    |     |      |       |        |     |        |    |     |        |     |     |
| 200  | 110         | 40 | 224 | -    | -     | 385    | -   | 5      | 35 | 190 | 466    | -   | 490 |
|      | 140         |    |     |      |       |        |     |        |    |     |        |     |     |

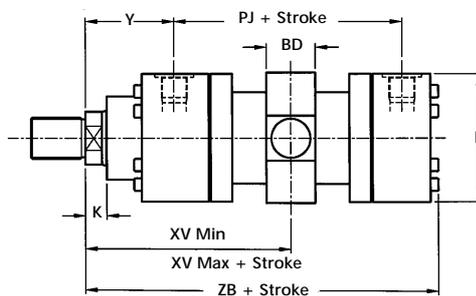
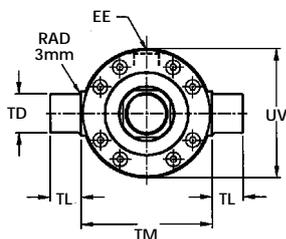
\*Not in accordance with Standard.

# TRUNNION & PIVOT MOUNTINGS

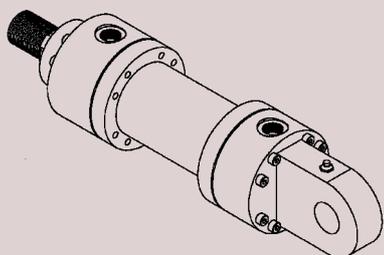
## Intermediate Fixed Trunnion Mount – Style MT4



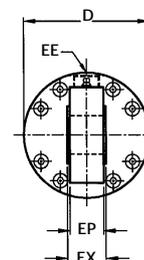
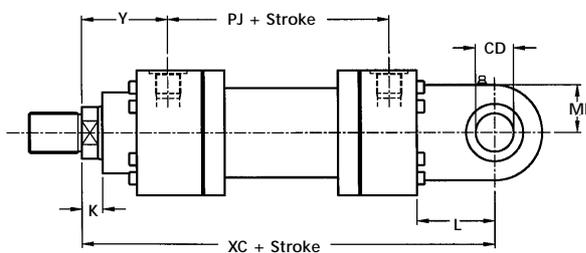
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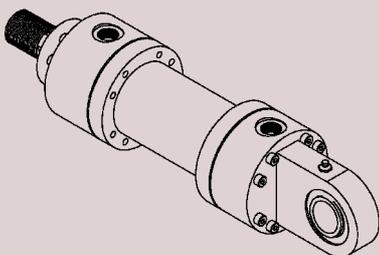
## Rear Pivot Mount – Style MP3



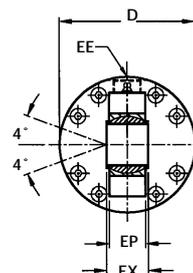
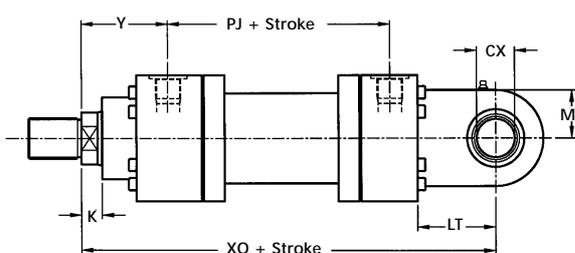
(ISO style MP3)



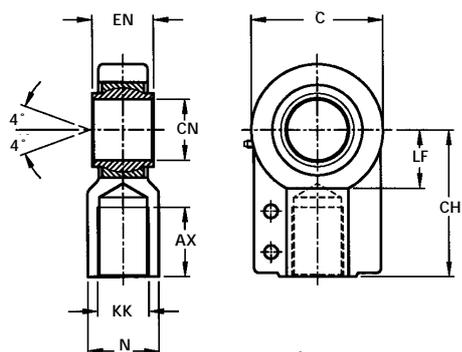
## Rear Spherical Bearing – Style MP5



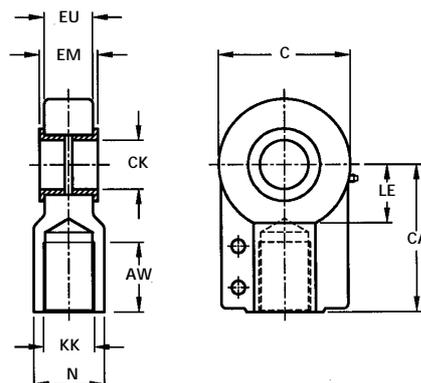
(ISO style MP5)



## Spherical Bearing Rod Eye



## Plain Bearing Rod Eye



# DIMENSIONS

| Bore | MM Rod Dia. | BD Max | CD H9 | CX H7 | D Max | EE BSP | EP | EX h12 | K  | L   |
|------|-------------|--------|-------|-------|-------|--------|----|--------|----|-----|
| 40   | 22          | 30     | 20    | 20    | 78    | 1/2    | 18 | 20     | 13 | 41  |
|      | 28          |        |       |       |       |        |    |        |    |     |
| 50   | 28          | 35     | 25    | 25    | 94    | 1/2    | 22 | 25     | 14 | 52  |
|      | 36          |        |       |       |       |        |    |        |    |     |
| 63   | 36          | 45     | 32    | 32    | 113   | 3/4    | 27 | 32     | 16 | 65  |
|      | 45          |        |       |       |       |        |    |        |    |     |
| 80   | 45          | 50     | 40    | 40    | 130   | 3/4    | 35 | 40     | 18 | 82  |
|      | 56          |        |       |       |       |        |    |        |    |     |
| 100  | 56          | 60     | 50    | 50    | 158   | 1      | 40 | 50     | 20 | 95  |
|      | 70          |        |       |       |       |        |    |        |    |     |
| 125  | 70          | 75     | 63    | 63    | 192   | 1      | 52 | 63     | 23 | 103 |
|      | 90          |        |       |       |       |        |    |        |    |     |
| 160  | 90          | 90     | 80    | 80    | 238   | 1 1/4  | 66 | 80     | 25 | 135 |
|      | 110         |        |       |       |       |        |    |        |    |     |
| 200  | 110         | 110    | 100   | 100   | 285   | 1 1/4  | 84 | 100    | 30 | 165 |
|      | 140         |        |       |       |       |        |    |        |    |     |

**Important Notice**  
For optional ports see page 8

Be sure to add Stroke to these Dimensions

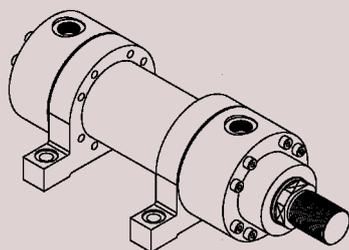
| Bore | MM Rod Dia. | LT  | MR  | MS  | PJ  | TD f8 | TL | TM h12 | UV Max | XC  | XO  | XV Min | XV Max | Y   | ZB   | Min Stroke MT4 |
|------|-------------|-----|-----|-----|-----|-------|----|--------|--------|-----|-----|--------|--------|-----|------|----------------|
| 40   | 22          | 41  | 25  | 25  | 97  | 20    | 16 | 90     | 78     | 231 | 231 | 123    | 98     | 71  | 196  | 25             |
|      | 28          |     |     |     |     |       |    |        |        |     |     |        |        |     |      |                |
| 50   | 28          | 52  | 32  | 32  | 111 | 25    | 20 | 105    | 95     | 257 | 257 | 140    | 105    | 72  | 213  | 35             |
|      | 36          |     |     |     |     |       |    |        |        |     |     |        |        |     |      |                |
| 63   | 36          | 65  | 40  | 40  | 117 | 32    | 25 | 120    | 116    | 289 | 289 | 158    | 108    | 82  | 234  | 50             |
|      | 45          |     |     |     |     |       |    |        |        |     |     |        |        |     |      |                |
| 80   | 45          | 82  | 50  | 50  | 134 | 40    | 32 | 135    | 130    | 332 | 332 | 175    | 125    | 91  | 260  | 50             |
|      | 56          |     |     |     |     |       |    |        |        |     |     |        |        |     |      |                |
| 100  | 56          | 95  | 63  | 63  | 162 | 50    | 40 | 160    | 158    | 395 | 395 | 204    | 149    | 108 | 312* | 55             |
|      | 70          |     |     |     |     |       |    |        |        |     |     |        |        |     |      |                |
| 125  | 70          | 103 | 71  | 71  | 174 | 63    | 50 | 195    | 195    | 428 | 428 | 231    | 161    | 121 | 337* | 70             |
|      | 90          |     |     |     |     |       |    |        |        |     |     |        |        |     |      |                |
| 160  | 90          | 135 | 90  | 90  | 191 | 80    | 63 | 240    | 240    | 505 | 505 | 272    | 182    | 143 | 386* | 90             |
|      | 110         |     |     |     |     |       |    |        |        |     |     |        |        |     |      |                |
| 200  | 110         | 165 | 112 | 112 | 224 | 100   | 80 | 295    | 300    | 615 | 615 | 335    | 245    | 190 | 466  | 90             |
|      | 140         |     |     |     |     |       |    |        |        |     |     |        |        |     |      |                |

\*Not in accordance with Standard.

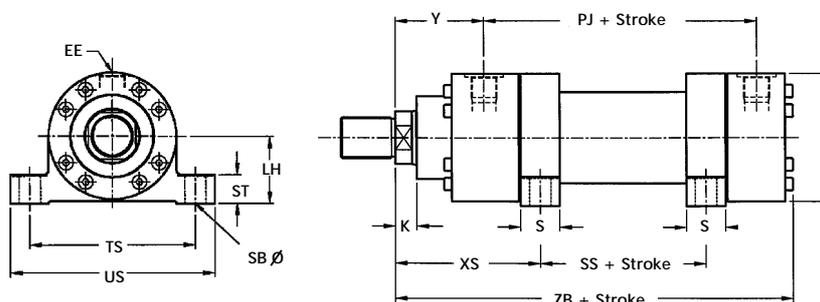
| Spherical & Plain Bearing Rod Eyes |             |                           |                       |         |     |         |         |         |     |         |         |     |       |                         |                    |                |                 |
|------------------------------------|-------------|---------------------------|-----------------------|---------|-----|---------|---------|---------|-----|---------|---------|-----|-------|-------------------------|--------------------|----------------|-----------------|
| Bore                               | MM Rod Dia. | Spherical Bearing Rod Eye | Plain Bearing Rod Eye | AW & AX | C   | CA & CH | CK & CN | EM & EN | EU  | KK      | LE & LF | N   | SCREW | Tightening Torque MA Nm | Nom. Cyl. Force KN | STATIC LOAD KN | DYNAMIC LOAD KN |
| 40                                 | 22          | REB-20LO                  | REF-20PO              | 23      | 47  | 52      | 20      | 20      | 17  | M16x1.5 | 22      | 25  | M8    | 32                      | 20                 | 48             | 30              |
|                                    | 28          | REB-25LO                  | REF-25PO              | 29      | 58  | 65      | 25      | 25      | 21  | M20x1.5 | 27      | 30  | M8    | 32                      | 32                 | 78             | 48              |
| 50                                 | 28          | REB-32LO                  | REF-32PO              | 37      | 70  | 80      | 32      | 32      | 27  | M27x2   | 32      | 38  | M10   | 64                      | 50                 | 114            | 67              |
|                                    | 36          |                           |                       |         |     |         |         |         |     |         |         |     |       |                         |                    |                |                 |
| 63                                 | 36          | REB-40LO                  | REF-40PO              | 46      | 89  | 97      | 40      | 40      | 32  | M33x2   | 41      | 47  | M10   | 64                      | 80                 | 204            | 100             |
|                                    | 45          |                           |                       |         |     |         |         |         |     |         |         |     |       |                         |                    |                |                 |
| 80                                 | 45          | REB-50LO                  | REF-50PO              | 57      | 108 | 120     | 50      | 50      | 40  | M42x2   | 50      | 58  | M12   | 110                     | 125                | 310            | 156             |
|                                    | 56          |                           |                       |         |     |         |         |         |     |         |         |     |       |                         |                    |                |                 |
| 100                                | 56          | REB-63LO                  | REF-63PO              | 64      | 132 | 140     | 63      | 63      | 52  | M48x2   | 62      | 70  | M12   | 110                     | 200                | 430            | 255             |
|                                    | 70          |                           |                       |         |     |         |         |         |     |         |         |     |       |                         |                    |                |                 |
| 125                                | 70          | REB-80LO                  | REF-80PO              | 86      | 168 | 180     | 80      | 80      | 66  | M64x3   | 78      | 90  | M16   | 195                     | 320                | 695            | 400             |
|                                    | 90          |                           |                       |         |     |         |         |         |     |         |         |     |       |                         |                    |                |                 |
| 160                                | 90          | REB-100LO                 | REF-100PO             | 96      | 210 | 210     | 100     | 100     | 84  | M80x3   | 98      | 110 | M20   | 385                     | 500                | 1060           | 610             |
|                                    | 110         |                           |                       |         |     |         |         |         |     |         |         |     |       |                         |                    |                |                 |
| 200                                | 110         | REB-125LO                 | REF-125PO             | 113     | 262 | 260     | 125     | 125     | 102 | M100x3  | 120     | 135 | M20   | 385                     | 800                | 1430           | 950             |
|                                    | 140         |                           |                       |         |     |         |         |         |     |         |         |     |       |                         |                    |                |                 |

# SIDE LUG MOUNT & DIMENSIONS

## Side Lug Mount – Style MS2

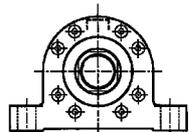


(Style MS2)



### Important Notice

For optional ports see page 8  
The MS2 mounting shown above does not conform to ISO6020/1 standards. Should the ISO6020/1 MS2 mounting be specified (see drawing below) then please consult factory for details.



(ISO Style MS2)

Be Sure To Add Stroke To This Dimension

| Bore | MM Rod Dia. | D Max | EE BSP | K  | LH h10 | PJ  | S  | SB | SS | ST | TS  | US  | XS  | Y   | ZB Max | Min Stroke MS2 |
|------|-------------|-------|--------|----|--------|-----|----|----|----|----|-----|-----|-----|-----|--------|----------------|
| 40   | 22          | 78    | 1/2    | 13 | 48     | 97  | 25 | 11 | 24 | 20 | 110 | 130 | 106 | 71  | 196    | 30             |
|      | 28          |       |        |    |        |     |    |    |    |    |     |     |     |     |        |                |
| 50   | 28          | 94    | 1/2    | 14 | 52     | 111 | 32 | 14 | 26 | 25 | 120 | 145 | 116 | 72  | 213    | 40             |
|      | 36          |       |        |    |        |     |    |    |    |    |     |     |     |     |        |                |
| 63   | 36          | 113   | 3/4    | 16 | 62     | 117 | 32 | 18 | 33 | 25 | 145 | 180 | 123 | 82  | 234    | 50             |
|      | 45          |       |        |    |        |     |    |    |    |    |     |     |     |     |        |                |
| 80   | 45          | 130   | 3/4    | 18 | 70     | 134 | 40 | 22 | 42 | 30 | 170 | 210 | 136 | 91  | 260    | 60             |
|      | 56          |       |        |    |        |     |    |    |    |    |     |     |     |     |        |                |
| 100  | 56          | 158   | 1      | 20 | 82     | 162 | 50 | 26 | 49 | 35 | 200 | 245 | 164 | 108 | 312    | 80             |
|      | 70          |       |        |    |        |     |    |    |    |    |     |     |     |     |        |                |
| 125  | 70          | 192   | 1      | 23 | 100    | 174 | 56 | 33 | 55 | 35 | 245 | 300 | 180 | 121 | 337    | 120            |
|      | 90          |       |        |    |        |     |    |    |    |    |     |     |     |     |        |                |
| 160  | 90          | 238   | 1 1/4  | 25 | 142    | 191 | 56 | 33 | 66 | 45 | 320 | 400 | 206 | 143 | 386    | 250            |
|      | 110         |       |        |    |        |     |    |    |    |    |     |     |     |     |        |                |
| 200  | 110         | 285   | 1 1/4  | 30 | 170    | 224 | 60 | 36 | 90 | 50 | 400 | 500 | 257 | 190 | 466    | 300            |
|      | 140         |       |        |    |        |     |    |    |    |    |     |     |     |     |        |                |

MS2 mounting dimensions in above table not in accordance with standard.

# CUSHIONS

## Cushions

Tapered cushions, designed to provide gradual deceleration and eliminate shock upon entrance of the cushion pistons, have now been considerably improved. The tapered cushion has been married with a fine thread, wide range, adjusting screw. This new combination offers a positive, low shock deceleration and a

method to adjust the cushioning effect for speeds and loads.

The adjusting screw is identified by a cross-slot in the head of the screw. It does not project beyond the surface of the head (or cap) through its full range of adjustment so no clearance need be considered on close fit installations. The adjusting screw and the cushion check can be interchanged in the same cylinder end. This flexibility can be important if, after installation, it is discovered that the adjusting screw is inaccessible.

The cushion check, which does not require adjustment, has a single slot in its head. It does not project beyond the surface of the head (or cap). The cushion check plus the tapered cushion piston provides rapid acceleration out of cushioning. There is no spring in the cushion check to fatigue, hence, no worry of mechanical failure.

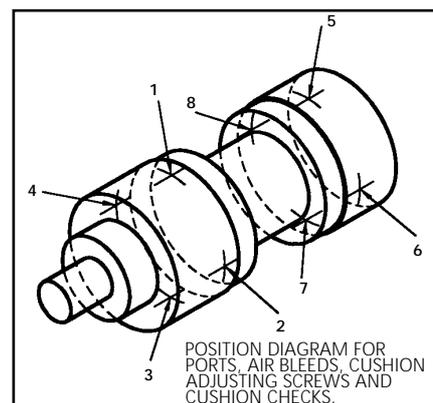
All cushion screws are held captive by a spring-loaded retaining ring. This ring is removable for maintenance or changeover purposes.

Cushioning is designed to properly cushion the cylinder and is not intended to cushion large inertia loads. Cushions do not substitute for speed controls or deceleration valves on most installations.

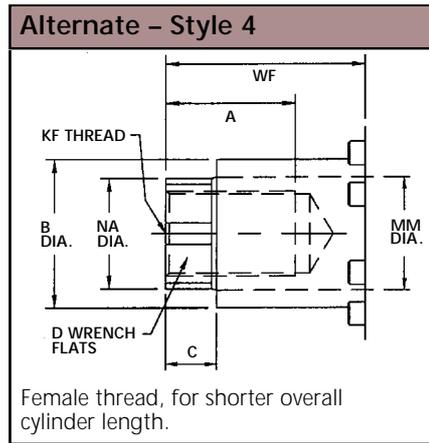
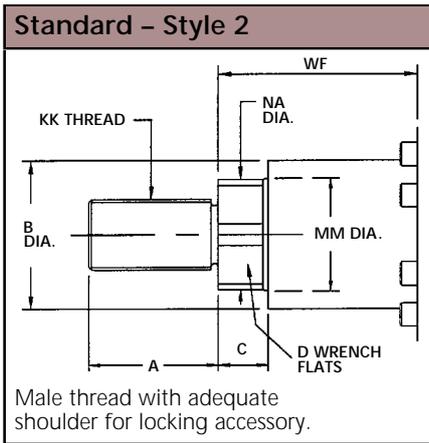
The standard positions for ports are 1 and 5 (see diagram below). Where possible, the standard for cushion adjusting screws will be 2 and 6 and the standard positions for cushion checks will be 4 and 8.

## Cushion Lengths

| Bore | Rod | Cushion Length Head | Cushion Length Cap |
|------|-----|---------------------|--------------------|
| 40   | All | 22                  | 22                 |
| 50   | All | 22                  | 22                 |
| 63   | All | 22                  | 22                 |
| 80   | All | 22                  | 25                 |
| 100  | All | 22                  | 25                 |
| 125  | All | 25                  | 25                 |
| 160  | All | 25                  | 28                 |
| 200  | All | 25                  | 38                 |



# ROD END INFORMATION



**Important**

**Specify on order**

1. Type of thread
2. Length of thread
3. Rod extension if non-standard
4. Any non standard thread please supply full details

| ISO 6020/1 |             |     |             |    |     |           |     |           |    |
|------------|-------------|-----|-------------|----|-----|-----------|-----|-----------|----|
| Bore       | MM Rod Dia. | A   | B Dia. (f8) | C  | D   | KK        | NA  | KF        | WF |
| 40         | 22          | 22  | 50          | 13 | 18  | M16 x 1.5 | 21  | M16 x 1.5 | 32 |
|            | 28          | 28  |             |    | 22  | M20 x 1.5 | 27  | M20 x 1.5 |    |
| 50         | 28          | 28  | 60          | 14 | 22  | M20 x 1.5 | 27  | M20 x 1.5 | 38 |
|            | 36          | 36  |             |    | 30  | M27 x 2   | 34  | M27 x 2   |    |
| 63         | 36          | 36  | 70          | 16 | 30  | M27 x 2   | 34  | M27 x 2   | 45 |
|            | 45          | 45  |             |    | 39  | M33 x 2   | 43  | M33 x 2   |    |
| 80         | 45          | 45  | 85          | 18 | 39  | M33 x 2   | 43  | M33 x 2   | 54 |
|            | 56          | 56  |             |    | 48  | M42 x 2   | 54  | M42 x 2   |    |
| 100        | 56          | 56  | 106         | 20 | 48  | M42 x 2   | 54  | M42 x 2   | 57 |
|            | 70          | 63  |             |    | 62  | M48 x 2   | 68  | M48 x 2   |    |
| 125        | 70          | 63  | 132         | 23 | 62  | M48 x 2   | 68  | M48 x 2   | 60 |
|            | 90          | 85  |             |    | 80  | M64 x 3   | 88  | M64 x 3   |    |
| 160        | 90          | 85  | 160         | 25 | 80  | M64 x 3   | 88  | M64 x 3   | 66 |
|            | 110         | 95  |             |    | 100 | M80 x 3   | 108 | M80 x 3   |    |
| 200        | 110         | 95  | 200         | 30 | 100 | M80 x 3   | 108 | M80 x 3   | 75 |
|            | 140         | 112 |             |    | 128 | M100 x 3  | 138 | M100 x 3  |    |

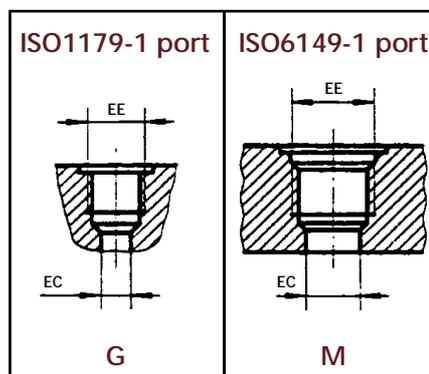
# PORTING AND AIR BLEEDS

## Porting

BSP Ports will be supplied with spotface for sealing washers as standard unless otherwise specified. Alternative ports, as listed opposite, may be specified. In addition, we can also offer square and rectangular flange ports to ISO6164 and ISO6162-1 – consult factory.

## Air Bleeds

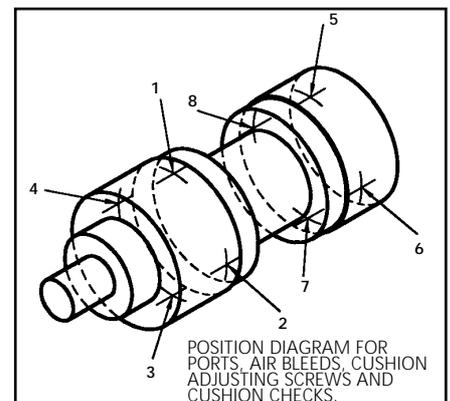
An air bleed may be ordered at either or both ends of the cylinder as an option. The air is bled from the cylinder by backing out the bleed plug to allow air to pass by the threads. When air bubbles stop and oil starts to flow, re-tighten plug. It is recommended that bleeding be done with pressure on the opposite end of the cylinder so that the bleed plug is not subjected to pump pressure when being backed out. Air bleeds should always be positioned at the highest point of the cylinder. Please specify positions of air bleeds by position number from the chart.



| Bore | G       |    | M         |    |
|------|---------|----|-----------|----|
|      | EE      | EC | EE        | EC |
| 40   |         |    |           |    |
| 50   | G 1/2   | 14 | M22 x 1,5 | 14 |
| 63   | G 3/4   | 18 | M27 x 2   | 18 |
| 80   | G 1     | 23 | M33 x 2   | 23 |
| 100  |         |    |           |    |
| 125  | G 1     | 23 | M33 x 2   | 23 |
| 160  | G 1 1/4 | 30 | M42 x 2   | 30 |
| 200  |         |    |           |    |

## Port Positions

All ports are supplied in positions 1 and 5 as standard. Please specify optional positions as required.

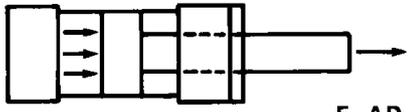


# THEORETICAL FORCES DEVELOPED BY CYLINDERS

| Bore | Rod | Effective Area Push sq.mm | Effective Area Pull sq.mm | Theoretical Force in Newtons at Various Pressures (in bars) |       |        |        |        |        |         |        |         |        |         |        |
|------|-----|---------------------------|---------------------------|---|-------|--------|--------|--------|--------|---------|--------|---------|--------|---------|--------|
|      |     |                           |                           | 35 bar  |       | 50 bar |        | 70 bar |        | 100 bar |        | 125 bar |        | 160 bar |        |
|      |     |                           |                           | Push  | Pull  | Push   | Pull   | Push   | Pull   | Push    | Pull   | Push    | Pull   | Push    | Pull   |
| 40   | 22  | 1257                      | 877                       | 4400  | 3070  | 6285   | 4385   | 8799   | 6139   | 12570   | 8770   | 15713   | 10963  | 20112   | 14032  |
|      | 28  | 1257                      | 641                       | 4400  | 2244  | 6285   | 3205   | 8799   | 4487   | 12570   | 6410   | 15713   | 8013   | 20112   | 10256  |
| 50   | 28  | 1964                      | 1348                      | 6874  | 4718  | 9820   | 6740   | 13748  | 9436   | 19640   | 13480  | 24550   | 16850  | 31424   | 21568  |
|      | 36  | 1964                      | 946                       | 6874  | 3311  | 9820   | 4730   | 13748  | 6622   | 19640   | 9460   | 24550   | 11825  | 31424   | 15136  |
| 63   | 36  | 3117                      | 2100                      | 10910   | 7350  | 15585  | 10500  | 21819  | 14700  | 31170   | 21000  | 38963   | 26250  | 49872   | 33600  |
|      | 45  | 3117                      | 1526                      | 10910   | 5341  | 15585  | 7630   | 21819  | 10682  | 31170   | 15260  | 38963   | 19075  | 49872   | 24416  |
| 80   | 45  | 5027                      | 3436                      | 17595   | 12026 | 25135  | 17180  | 35189  | 24052  | 50270   | 34360  | 62838   | 42950  | 80432   | 54976  |
|      | 56  | 5027                      | 2564                      | 17595   | 8974  | 25135  | 12820  | 35189  | 17948  | 50270   | 25640  | 62838   | 32050  | 80432   | 41024  |
| 100  | 56  | 7854                      | 5391                      | 27489   | 18869 | 39270  | 26955  | 54978  | 37737  | 78540   | 53910  | 98175   | 67388  | 125664  | 86256  |
|      | 70  | 7854                      | 4005                      | 27489   | 14018 | 39270  | 20025  | 54978  | 28035  | 78540   | 40050  | 98175   | 50063  | 125664  | 64080  |
| 125  | 70  | 12272                     | 8423                      | 42952   | 29481 | 61360  | 42115  | 85904  | 58961  | 122720  | 84230  | 153400  | 105288 | 196352  | 134768 |
|      | 90  | 12272                     | 5910                      | 42952   | 20685 | 61360  | 29550  | 85904  | 41370  | 122720  | 59100  | 153400  | 73875  | 196352  | 94560  |
| 160  | 90  | 20106                     | 13743                     | 70371   | 48101 | 100530 | 68715  | 140742 | 96201  | 201060  | 137430 | 251325  | 171788 | 321696  | 219888 |
|      | 110 | 20106                     | 10603                     | 70371   | 37111 | 100530 | 53015  | 140742 | 74221  | 201060  | 106030 | 251325  | 132538 | 321696  | 169648 |
| 200  | 110 | 31416                     | 21911                     | 109956  | 76689 | 157080 | 109555 | 219912 | 153377 | 314160  | 219110 | 392700  | 273888 | 502656  | 350576 |
|      | 140 | 31416                     | 16022                     | 109956  | 56077 | 157080 | 80110  | 219912 | 112154 | 314160  | 160220 | 392700  | 200275 | 502656  | 256352 |

Please note that these are theoretical forces only and consideration must be given to pressure drops in the system and pipe runs.

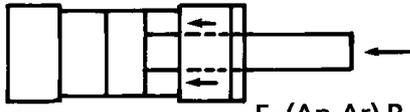
### Force Developed on Push Stroke



$$F = \frac{AP}{10}$$

Force (Newtons) = Area of Piston (in sq. mm) times Pressure (in bar) divided by 10

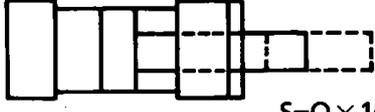
### Force Developed on Pull Stroke



$$F = \frac{(A_p - A_r) P}{10}$$

Force (Newtons) = Area of Piston (in sq. mm) less Area of Rod (in sq. mm) times Pressure (in bar) divided by 10

### Speed of Cylinder Travel



$$S = \frac{Q \times 10^3}{A}$$

S = Speed in metres per minute  
 Q = Pump delivery in litres per minute  
 A = Area of Piston in square mm - Rod Extend  
 or  
 A = Area of Piston minus Area of Rod - Rod Retract

## Rod Column Strength

When considering a long stroke cylinder, it is necessary to select a piston rod size of sufficient diameter to provide the required column strength. If the cylinder is performing work on the pull stroke only (rod in tension), then the standard rod will be suitable providing the rated pressure of 160 bar is not exceeded. However should the cylinder be operating in the push stroke (rod in compression) then careful consideration need to be given to column strength. Factors which must be taken into consideration are the stroke length, rod extension length, mounting style, mounting altitude, force potential and rod end connections. If in doubt please consult factory.

## Long Stroke Cylinders

Consideration must be given when selecting a cylinder with a long stroke with regards to mounting style, mounting altitude, column strength of the piston rod. If in doubt please consult factory.

# MODEL NUMBER

## Composition

| 63          | ER                            | FCF          | 25   | CC  | W  |
|-------------|-------------------------------|--------------|--|---|--|
| Bore        | Cylinder Series               | Mounting     | Stroke   | Cushion   | Modification   |
| As Required | ER – ISO6020/1<br>"Roundline" | Listed Below | As Required<br><br>Shown as Gross Stroke including Dual Piston or Stop Tube Length | CF – Cushion Front<br><br>CR – Cushion Rear<br><br>CC – Cushion both ends | A – Variation in Ports<br><br>D – Double Rod Extension<br><br>K – Any variation in Rod from Standard. Any variation from Standard Style 2 Rod End.<br><br>M – Variation in Mounting<br>W – Water Fitted<br>Y – Variation in Construction |

## Mounting Styles

FCF – Front Circular Flange  
 FRF – Front Rectangular Flange  
 P – Pivot  
 RCF – Rear Circular Flange  
 RRF – Rear Rectangular Flange  
 T – Trunnion  
 SBp – Spherical Bearing  
 SL – Side Lug

## Order Information

To insure prompt delivery, please **BE SURE IN INCLUDE THIS INFORMATION WHEN ORDERING:**

- Quantity
- Series
- Bore
- Stroke – Gross Stroke always show in Model Number
- Dual Piston Or Stop Tube
- Mounting Style
- Cushion (front, rear, both or none)
- Rod End Style (if other than Style 2 standard)
- Rod Size (standard or oversize)
- Extra Rod Extension (where required)
- Port Size (if other than standard)
- Port Positions other than standard positions 1 and 5
- Cushion check, adjusting screw, and bleed positions (when required) if other than standard positions
- Medium (specify type of fluid)
- Operating Pressure and Maximum Shock Pressure
- Temperature
- Double rod extension (when required)
- XI dimension on all Intermediate Trunnion cylinders
- Delivery required, or scheduling

**Complete and correct ordering information will eliminate untimely delays. When in doubt always contact our factory.**

## Policy and Warranty

**POLICY** The policy is one of continual improvement in design and manufacture to assure still finer products, hence, specifications are subject to change without notice.

**WARRANTIES AND LIABILITIES** Goods alleged by the Buyer to be defective or not to conform to the Contract and accepted by the Company as such during the period of 12 months after delivery will be replaced by the Company or if the Company shall so decide the total price in respect of the Goods shall be refunded to the Buyer. The total liability of the Company for any loss or damages or expenses of any description direct or indirect suffered by the Buyer and attributable to the Goods shall not exceed in total One million pounds Sterling. No claim in respect of allegedly defective Goods shall be valid unless the claim is made in writing immediately after the Buyer shall become aware of the alleged defect. Nor will such claim entitle the Buyer to cancel any outstanding part of the Order.

- For a full listing of the various types of hydraulic and pneumatic cylinders in the range please consult factory.
- Cylinders of all sizes, for all applications, pressures and fluid mediums... in almost every price range.
- Easily installed and serviced.
- Compact, rugged and reliable.
- Wide range of matched mounting accessories.
- Custom built variations of all standard cylinders at nominal cost.
- Cylinders to 750 mm bore in a variety of mountings and pressure ranges.